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SILVICAL LEAFLET 23.

BRISTLE-CONE PINE.

Pinus aristata Engelm.

Bristle-cone pine forms with limber pine a valuable protection forest on the dry southern slopes of the higher mountains in the Southwest. It is useful both in preventing erosion and in conserving the moisture. It has been cut extensively in central Nevada for mine timbers, and is used to some extent for ties and rough lumber. The wood is of poor quality, but valuable where no other timber is available.

RANGE AND OCCURRENCE.

Bristle-cone pine ranges from central Colorado westward through Utah, northern New Mexico and Arizona, Nevada, and eastern California, and from the Uinta Mountains of Utah on the north to Flagstaff, Ariz., on the south. The tree reaches its best development in the mountains of western Nevada and eastern California.

Its altitudinal range is higher on southern than on northern slopes. In Colorado it grows at elevations of from 8,000 to 12,000 feet; in Arizona from 9,000 to 12,400 feet; in Nevada and California from 7,500 to 10,800 feet.

In Colorado it occurs on ridges, rocky ledges, and southern slopes, and is often the only tree on the upper parts of southern slopes, where the upper northern slopes are occupied chiefly by Engelmann spruce. In central and southern Nevada and southeastern California it is found on the upper slopes of mountains and often predominates on the southern sides. In northern Arizona it grows on high, grassy mesas and park-like openings on the southern slopes of the mountains.

CLIMATE.

The extreme seasonal range of temperature experienced is approximately from -50° to 95° F.; the daily range of temperature is also great. The annual precipitation averages from 20 to 30 inches and is very largely in the form of snow. The atmosphere is dry and evaporation is rapid.

ASSOCIATED SPECIES.

It rarely forms pure forests but usually grows in a scattering stand, much like the piñon-juniper formation, with grass for ground cover and little or no underbrush. In Colorado it associates with Engelmann

spruce, limber pine, alpine fir, and lodgepole pine. In Nevada and California it is accompanied at lower altitudes by limber and yellow pines, white fir, and one-seed juniper, and higher up in the thickest part of its belt it forms fairly dense stands with limber pine alone. In the San Francisco Mountains it occurs in mixture with limber pine throughout its altitudinal range; it meets and mixes with western yellow pine at its lower limit and with aspen and Engelmann spruce at higher elevations.

HABIT.

Bristle-cone pine is commonly a rather small, bushy tree, under 40 feet high and from 10 to 18 inches in diameter. At timber line it is reduced to a low shrub, with gnarled, nearly prostrate stem. In the best situations it may attain an exceptional height of 75 feet and a diameter of 3 feet.

Young trees have a pyramidal form, with regular whorls of stout branches. Old trees in moderately close stands have short, tapering, knotty trunks, and narrow, irregular crowns. The upper branches are stout and erect or spreading, the lower ones smaller and pendulous. The bark on young stems is thin and gray or milky-white, but on older trunks it is from one-half to three-fourths of an inch thick, dark brown, and broken into broad, flat plates, which peel off in thin scales.

SOIL AND MOISTURE.

Bristle-cone pine usually grows on thin soils on rocky southern slopes, and, in the Southwest, often on the volcanic soils of cinder cones. Such sites usually receive full insolation, which causes the early melting of snow and facilitates evaporation. As a result the tree endures a more or less prolonged period of soil dryness during the summer.

TOLERANCE.

It is less tolerant than Engelmann spruce, but more tolerant than limber pine or most other pines.

REPRODUCTION.

Bristle-cone pine begins to bear cones when it is about twenty years old. Seed production takes place annually and seeds require two years to mature. Little is known in regard to the frequency of heavy seed years.

The seeds are winged and suited for wind distribution. They are also distributed by rodents and birds, and by gravity where the seed tree stands on a steep slope. Seeding takes place to distances of 600 feet and more.

It requires less light for germination than does limber pine, but more than Engelmann spruce. It prefers a mineral seed bed, but seedlings are often found growing in grass and litter. Reproduction thrives best on slopes with little underbrush.